REMARKS

Claims 1-3, 7-12 and 16-29 are pending in the application. All claims stand under final rejection. An amendment is being made herein to correct dependency of claim 16. Claims 1-3, 7-9, 12-14, 16-18, 21-22 and 25-27 stand rejected under 35 U.S.C. §1-3 as being obvious in view of Ravini, U.S. Patent No. 5,979,581 and Ghoneim, U.S. Patent No. 6,205,391. Claims 11-12, 19-20, 23-24 and 28-29 stand rejected under §103 in view of Ravini, Ghoneim, and further in view of Yasui, U.S. Patent No. 5,373,911. Claims 23 and 29 also stand rejected under §103 in view of Ravini, Ghoneim and Nagaoka, JP 07-320188.

With regard to the rejections under 35 U.S.C. §103 which all rely upon Ravani and Ghoneim Applicants traverse. The Ravani disclosure is directed towards an apparatus and method for automatic vehicle lane-keeping. That is, Ravani discloses a system for maintaining a vehicle within its lane and is sensing three points on the road to estimate the position of the vehicle relative to the lane as well as the geometry of the roadway. The position of the lane centerline and the curvature of the roadway are used to determine a lateral error signal for feedback control, the roadway curvature is used for feedforward control. The feedback and feedforward control are used to produce a steering control signal for the vehicle.

The Examiner asserted that Ravani teaches inherent features of understeering or oversteering conditions when operating the vehicle because if the steering angle remains the same while driving into or out of a curve, the car would leave the designated lane resulting in either oversteering or understeering. Applicant's respectfully traverse and present the following discussion in opposition to the Examiner's assertion.

It is respectfully asserted that oversteering and understeering are a function of steering and modifications to steering control in order to make an adjustment. The specification of the present invention defines understeering and oversteering conditions beginning at paragraph [0019]. Understeering occurs when the vehicle does not respond to a change in steering wheel angle. Oversteering occurs when the rear of the vehicle fishtails, or slips out laterally relative to the front of the vehicle. This is also a

result of a change in steering wheel angle. This is significantly different than the Examiner's assertion that oversteering and understeering occur without making any adjustment at all to the steering wheel angle. The Examiner asserted that understeering and oversteering can occur when the road direction changes, although the steering angle itself has not been modified. In the Examiner's assertion, the driver does not make an adjustment and only the lane direction has changed. However, the steering angle has not been altered at all, so "operating the vehicle when it is in an understeer or oversteer condition" cannot occur as no modification to the steering itself has been made. Therefore, it is respectfully asserted that the Ravani reference does not inherently teach understeering and oversteering as claimed by the applicants of the present invention.

Further, it is respectfully asserted that the present invention is directed to solving the very problem that is presented by the Ravani reference, which is designed to operate well within its limits. The present invention is directed toward a vehicle dynamics behavioral model wherein the vehicle is operated at or near its dynamic limit. In particular, each of independent claims 1, 12 and 21 require that certain steps be performed "when the vehicle model is understeering" which the Ravani reference does not disclose or suggest. In Ravani, the "vehicle dynamic model used for the control design and subsequent simulation is the well-known simple 'bicycle' model with the linear non-dynamic tire model". (Column 5, lines 57-59.) The model used in Ravani is based on the size of the error between the look ahead path and the intended path and is not designed to test the limits of control of the vehicle. Ravani teaches the steering wheel angle is measured from zero to a plus or minus angular direction. Because of this, the computer model in Ravani would generate undesirable steering wheel angles to compensate for variations in the desired path. In contrast the present invention teaches determination of an initial non-zero steering wheel angel input to the computer model such that a new current steering wheel angle based on the size of the error between the look ahead point and the desired path.

The Examiner asserted that Ravani determines an initial non-zero steering wheel angle input to the computer model at column 8, lines 25-39 in disclosing a non-zero steering wheel angle in curves. However, the lateral error discussed in Ravani is not a

steering wheel angle. The lateral error is a designation of a component based on the position and geometry of the roadway that is then used as feedback, column 1, lines 64-66). The lateral error as taught in Ravani is not an initial non-zero steering angle as disclosed and claimed in the present invention. Ravani goes on to teach that the lateral error is a component used for feedback in determining a feedforward steering angle term, which further differentiates the lateral error of Ravani from the initial non-zero steering angle of the present invention. Referring again to column 8, lines 25-39, the feedforward steering angle components for feedforward and feedback are shown in comparison to the curvature information being received from the three-point laser sensor. It is respectfully asserted that this comparison merely shows that the use of curvature information reduces the required feedback controller bandwidth and it does not teach or disclose determining an initial non-zero steering angle as disclosed and claimed in the present invention.

It is respectfully asserted that the Ravani reference does not teach or disclose determination of an initial non-zero steering wheel angle input to the computer model. Further, the Examiner asserted that the Ravani reference does not teach or disclose operating the computer model with the initial steering wheel angle until the error is decreasing when the vehicle is understeering, or the controller determining when the vehicle model is understeering in response to a yaw acceleration greater than a threshold and an increasing steering wheel angle.

The Examiner asserted that the Ghoneim reference discloses estimation of vehicle yaw, wherein understeer is determined in response to a yaw acceleration greater than a threshold and an increasing steering wheel angle. Applicant's respectfully traverse. The Examiner also asserted that Ravani in combination with Ghoneim teaches the Applicants' invention. Applicants respectfully traverse.

The present invention requires determination of an initial non-zero steering wheel angle input to the computer model such that a new current steering wheel angle based on the size of the error between the look ahead point and the desired path is set. As discussed above, typically the steering wheel angle is measured from zero to a plus or minus angular direction. This feature is neither taught nor disclosed in the Ghoneim

reference as well. Therefore, even if Ravani were combined with Ghoneim as suggested by the Examiner, their combination would not result in the Applicant's invention.

The Ghoneim reference is directed to vehicle yaw control that does not require a yaw sensor. At column 1, lines 53-58, Ghoneim discloses the operator steering angle and the vehicle velocity are used to determine a desired yaw rate. At column 3, lines 8-22 Ghoneim discloses an understeer coefficient that is used in determining a yaw rate value. Further, at column 5, lines 18-35 of Ghoneim, the onset of instability is disclosed. The feature is intended to indicate the presence of a condition in which the vehicle has a tendency to become unstable, based on acceleration of the un-driven wheels.

It is respectfully asserted that the presence of an understeer coefficient in Ghoneim are in no way directed to understeering as claimed in the present invention. The Ghoneim reference teaches that in a case of lateral instability, the controller commands one or more actuators to selectively increase or decrease the brake forces generated at the various wheels. However, the reference does not teach or disclose that when the vehicle model is understeering, the computer model is operated with the initial non-zero steering wheel angle input until an error of the first steering wheel angle and the initial steering wheel angle is decreasing. Instead, at column 3, the reference discloses that a yaw command is determined based on various inputs including vehicle speed and a measured steering angle, which may include an understeer coefficient. However, it is respectfully asserted that the reference does not teach or disclose the when the vehicle model is understeering, the computer model is operated with the initial steering wheel angle input until an error of the first steering wheel angle and the initial steering wheel angle is decreasing.

There is no mention of a non-zero initial steering angle, nor of a comparison between the initial steering angle and a first steering angle, let alone operating the computer model with the initial steering wheel angle until an error of the first steering wheel angle and the initial steering wheel angle is decreasing in the Ghoneim reference. It is respectfully asserted that the reference only discloses the use of a measured steering angle in the determination of a desired yaw rate value. The Ghoneim reference

remains silent as to whether the measured steering angle is increasing or decreasing and it remains silent as to an error, an initial non-zero steering wheel angle and a first steering wheel angle. Therefore, it is respectfully asserted that an error comparison is not being taught or disclosed in Ghoneim, and that a direct measurement is all that is required in determining the desired yaw rate according to Ghoneim's teachings. Therefore, the reference cannot possibly teach or suggest operating a computer model until an error of the first steering wheel angle and the initial steering wheel angle is decreasing as claimed by the Applicants, even if the reference were combined with Ravani as suggested by the Examiner.

Applicants request that the rejections under 35 U.S.C. §103 be withdrawn because Ravani in combination with Ghoneim does not suggest performing the claimed method steps when the vehicle is understeering as determined by a decreasing error of the first steering wheel angle and the initial non-zero steering wheel angle.

Having overcome all of the objections and rejections set forth in the Office Action, Applicants submit that claims 1-3, 7-12 and 16-29 are in a condition for allowance. A Notice of Allowance indicating the same is therefore earnestly solicited. The Examiner is invited to telephone the Applicants' undersigned attorney if any unresolved matters remain.

Respectfully Submitted,

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